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Opgenorth

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(54) **RELEASABLE LOCKING CONNECTOR ASSEMBLY**

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H01R 13/621	(2006.01)
H01R 13/625	(2006.01)

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CPC ***H01R 13/622*** (2013.01); ***H01R 13/62*** (2013.01); ***H01R 13/621*** (2013.01); ***H01R 13/623*** (2013.01); ***H01R 13/625*** (2013.01)

(58) **Field of Classification Search**

USPC 439/321, 306, 310, 315, 318, 320

See application file for complete search history.

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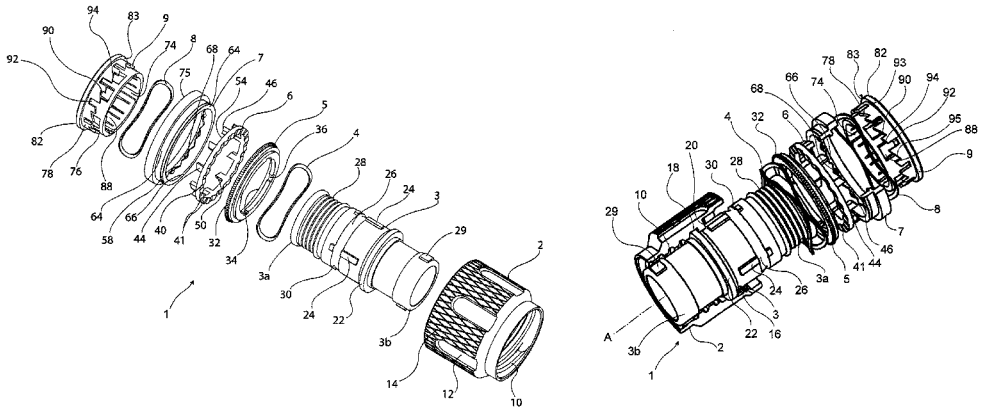
(57) **ABSTRACT**

A releasable locking connector assembly includes a coupling nut rotatably coupled to a connector body; splines on the connector body or the coupling nut; and a lock ring having mating splines that is translatable with respect to the connector body and the coupling nut between engaged and disengaged positions. The mating splines engage the splines when the lock ring is in the engaged position to prevent rotation of the coupling nut, and the mating splines are spaced from the splines when the lock ring is in the disengaged position to permit rotation of the coupling nut. A moveable index ring is movable between a locked position, in which the lock ring is in the engaged position, and an unlocked position, in which the lock ring is in the disengaged position. A push ring sequentially moves the moveable index ring between the locked and unlocked positions.

20 Claims, 5 Drawing Sheets



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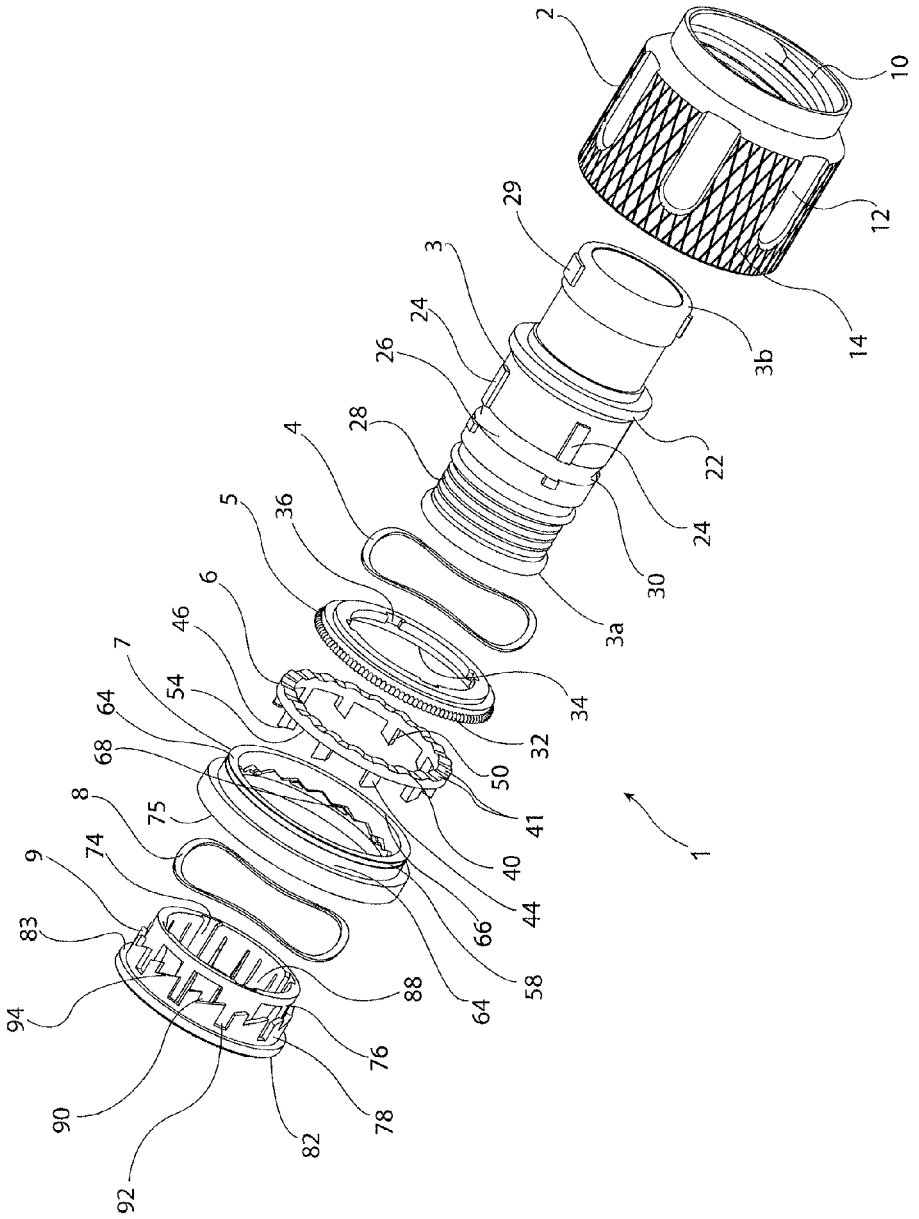
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FIG. 1A

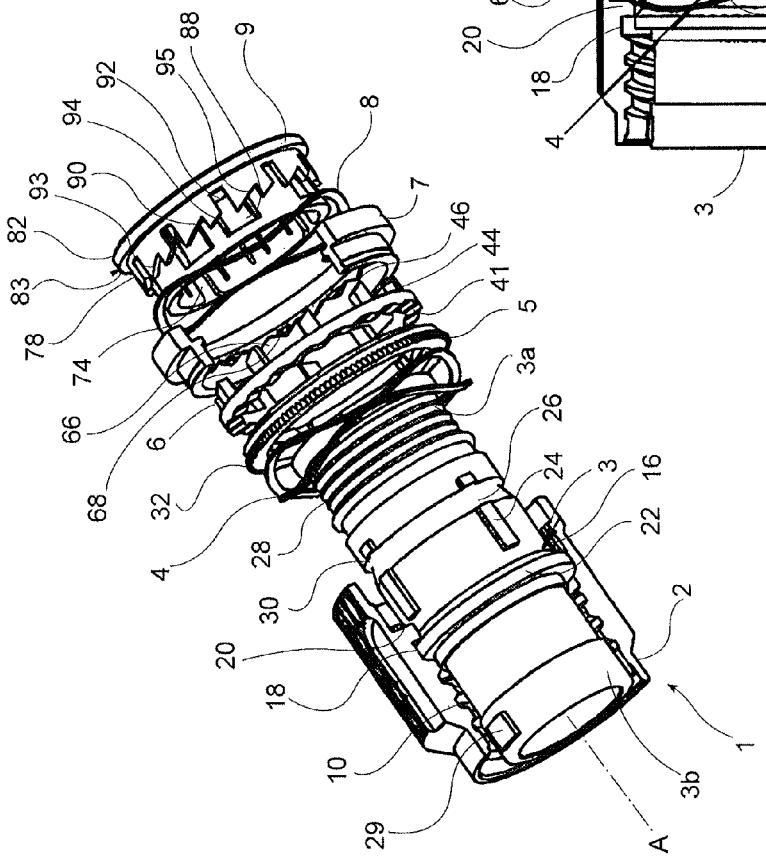
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FIG. 1B

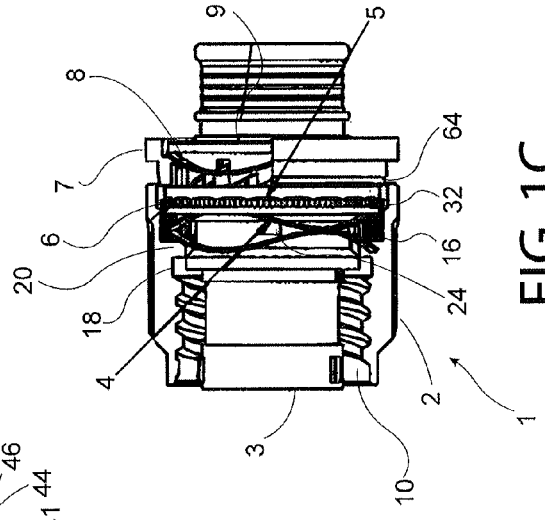
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FIG. 1C

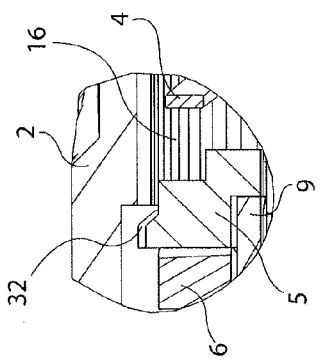

FIG. 2B

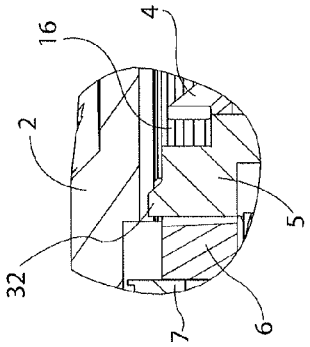

FIG. 3B

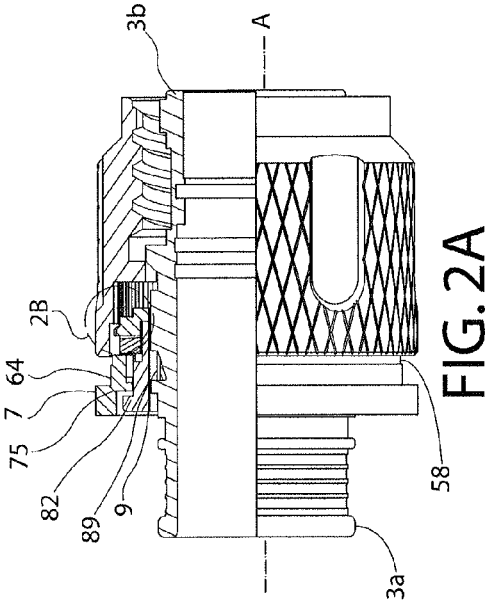

FIG. 2A

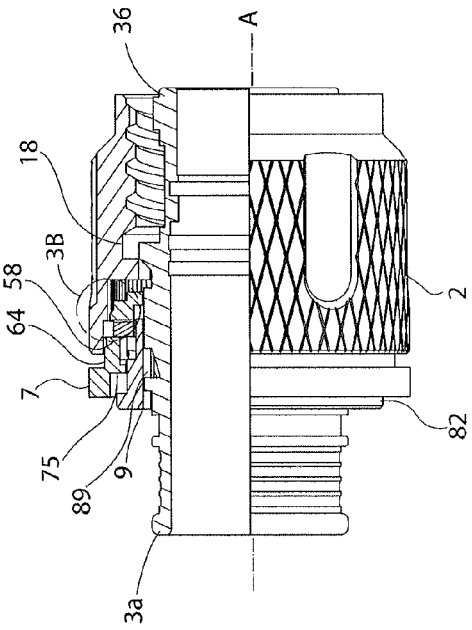

FIG. 3A

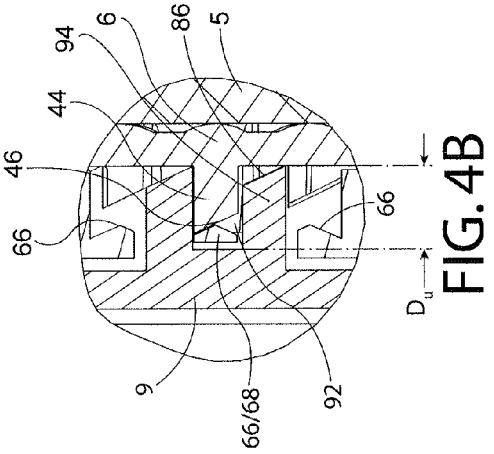

FIG. 4B

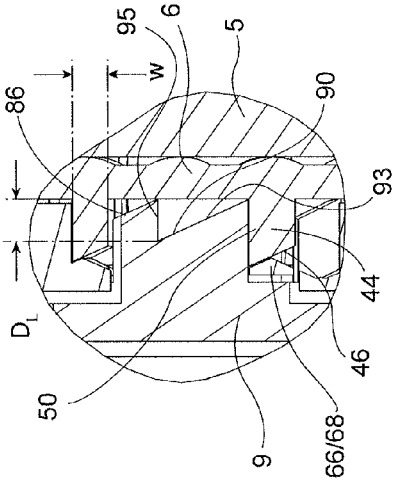

FIG. 5B

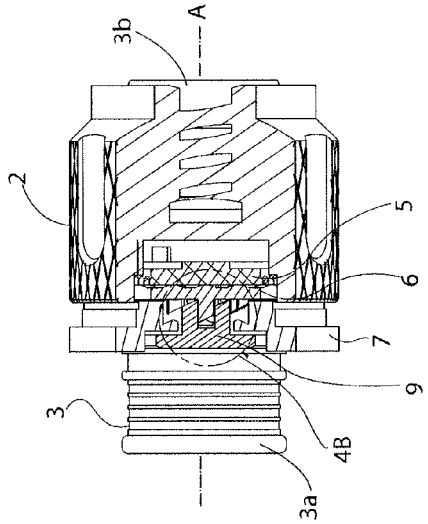

FIG. 4A

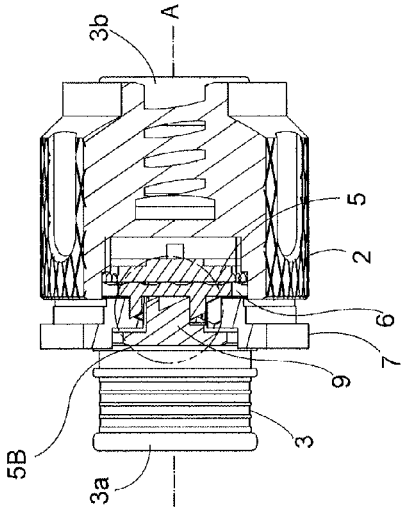

FIG. 5A

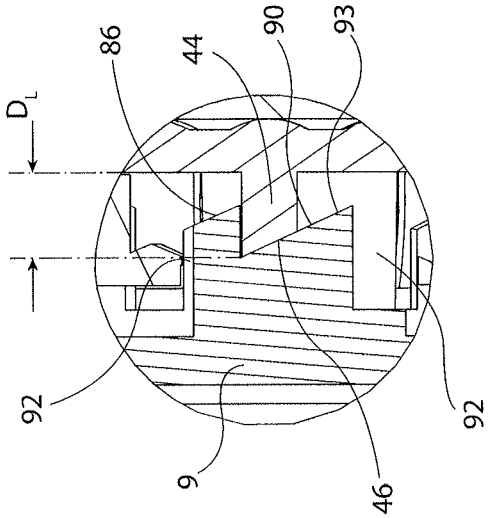

FIG.6B

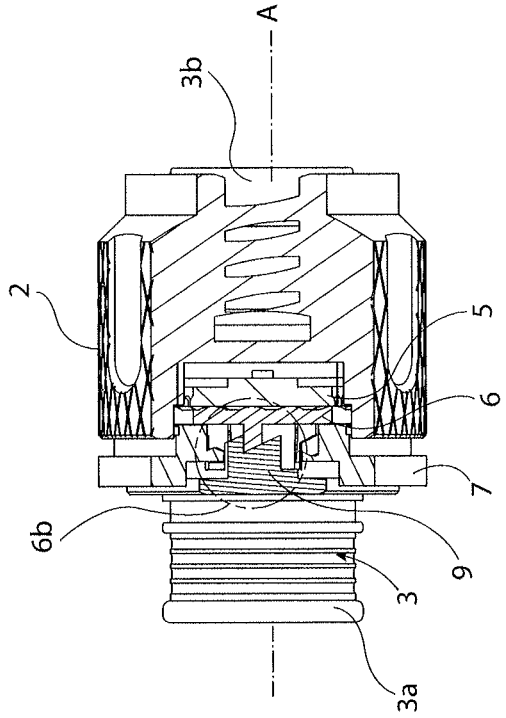

FIG.6A

RELEASABLE LOCKING CONNECTOR ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to locking mechanisms for coupling connectors.

BACKGROUND OF THE INVENTION

Connectors that are designed to resist uncoupling without external influences are currently using various technologies to add resistance to uncoupling forces. However, such connectors are susceptible to uncoupling caused by external forces such as vibration when such couplings are connected. There is a need for improved coupling assemblies and locking mechanisms for withstanding external forces when coupled.

SUMMARY OF THE INVENTION

According to one aspect of the invention, a releasable locking connector assembly comprises a connector body; a coupling nut that is rotatably coupled to the connector body; a first set of splines that are positioned on either the connector body or the coupling nut; a lock ring having a second set splines, the lock ring being axially movable with respect to the connector body and the coupling nut between an engaged position and a disengaged position, wherein the second set of splines of the lock ring engage the first set of splines when the lock ring is in the engaged position to prevent rotation of the coupling nut with respect to the connector body, and the second set of splines of the lock ring are disengaged from the first set of splines when the lock ring is in the disengaged position to permit rotation of the coupling nut with respect to the connector body; a moveable index ring movable between a locked position, in which the lock ring is maintained in the engaged position, and an unlocked position, in which the lock ring is maintained in the disengaged position; and a push ring for sequentially moving the moveable index ring between the locked and unlocked positions.

According to another aspect of the invention, a releasable locking connector assembly comprises a connector body; a coupling nut that is rotatably coupled to the connector body; a lock ring that is axially movable with respect to the connector body and the coupling nut between an engaged position, in which rotation of the coupling nut with respect to the connector body is prevented, and a disengaged position, in which rotation of the coupling nut with respect to the connector body is permitted; a moveable index ring that bears on the lock ring and is movable between a locked position, in which the lock ring is maintained in the engaged position, and an unlocked position, in which the lock ring is maintained in the disengaged position; and a push ring for sequentially moving the moveable index ring between the locked and unlocked positions.

According to yet another aspect of the invention, a releasable locking connector assembly comprises a connector body; a coupling nut that is rotatably coupled to the connector body; a lock ring that is axially movable with respect to the connector body and the coupling nut between an engaged position, in which rotation of the coupling nut with respect to the connector body is prevented, and a disengaged position, in which rotation of the coupling nut with respect to the connector body is permitted; a rotatable index ring that bears on the lock ring and is movable between a locked position, in which the lock ring is maintained in the engaged position, and an unlocked position, in which the lock ring is maintained in the disengaged position; and a fixed index ring that cooperates with the rotatable index ring, wherein the rotatable index ring is positionable on the fixed index ring to either the locked position or the unlocked position.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is best understood from the following detailed description when read in connection with the accompanying drawings, with like elements having the same reference numerals. Included in the drawings are the following figures:

FIG. **1**A is an exploded view of a locking connector assembly according to one exemplary embodiment of the invention.

FIG. **1**B is a partially exploded view of the locking connector assembly.

FIG. **1**C is a cross-sectional side view of the locking connector assembly shown in an assembled configuration.

FIGS. **2**A and **2**B are side and detailed views, respectively, of the locking connector assembly shown in an unlocked position and partially cut away.

FIGS. **3**A and **3**B are side and detailed views, respectively, of the locking connector assembly shown in a locked position and partially cut away.

FIGS. **4**A and **4**B are side and detailed views, respectively, of the locking connector assembly shown in an unlocked position and partially cut away.

FIGS. **5**A and **5**B are side and detailed views, respectively, of the locking connector assembly shown in an unlocked position and partially cut away.

FIGS. **6**A and **6**B are side and detailed views, respectively, of the locking connector assembly shown in a locked position and partially cut away.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. **1**A-**1**C depict a releasable locking connector assembly **1** according to one exemplary embodiment of the invention. Unless otherwise noted, each of the components of the locking connector assembly **1** has a substantially cylindrical shape with a hollow interior. Also, as used herein, the term 'distal' refers to a position either at or toward a first end **3***a* of a connector body **3**, and the term 'proximal' refers to a position either at or toward the second end **3***b* of the connector body **3**.

The releasable locking connector assembly **1** generally comprises a coupling nut **2** that is releasably fixed to a hollow connector body **3** by a lock ring **5**; a fixed index ring **9** that is fixedly coupled to the connector body **3**; a push ring **7** that is slidably and non-rotatably coupled to the fixed index ring **9**; a rotatable index ring **6** (also referred to herein as a moveable index ring) that engages the fixed index ring **9** and is sandwiched between the push ring **7** and the lock ring **5**; a first resilient member **4** that is positioned to bias the lock ring **5** away from the coupling nut **2**; and a second resilient member **8** that is positioned to bias the push ring **7** against the rotatable index ring **6**, and bias the rotatable index ring **6** against the lock ring **5**.

The locking connector assembly **1** is movable between a locked position and an unlocked position. In the locked position of the assembly **1**, the coupling nut **2** is incapable of rotating on the connector body **3** thereby preventing removal of the nut **2** from a coupling member (not shown) that is threadedly attached to the nut **2**. In the unlocked position of the locking connector assembly **1**, the coupling nut **2** is capable of rotating on the connector body **3**, thereby permitting removal of the nut **2** (along with the entire locking con-

nector assembly **1**) from the coupling member (not shown) that is threadedly attached to the nut **2**.

Referring now to the individual components of the assembly **1**, the connector body **3** includes an elongated cylindrical body upon which the remaining components of the assembly **1** are mounted either directly or indirectly. The distal end **3***a* of the connector body **3** includes an area **28** that accepts optional connector accessories (not shown). The proximal end **3***b* of the connector body **3** includes lugs **29** that can engage a coupling member (not shown) that is coupled to the coupling nut **2**.

A series of axially extending rails **24** are provided on the exterior surface of the connector body **3**. The rails **24** are positioned through respective axial channels **36** in the lock ring **5** and channels **74** in the fixed index ring **9**. Engagement between the rails **24** and the channels **36** and **74** prevents the lock ring **5** and the fixed index ring **9** from rotating with respect to the connector body **3**. It should be understood that the rails may be positioned on the rings **5** and **9** and the channels may be provided on the connector body **3** to achieve the same result.

An annular recessed surface **26** is defined on the exterior surface of the connector body **3**. The recessed surface **26** is configured to accommodate resilient tabs **88** that are disposed on the surface **76** of the fixed index ring **9**. The top surface **89** (see FIG. **2**A) of each tab **88** bears on the shoulder **30** of the recessed surface **26**. Engagement between the tabs **88** and the recessed surface **26** prevents translation of the index ring **9** along the connector body **3**. Unlike the index ring **9**, the lock ring **5** is capable of translating along the connector body **3**.

An outwardly extending shoulder portion **22** is formed on the outer surface of the connector body **3** for engaging the coupling nut **2**. In an assembled form of the assembly **1**, the shoulder portion **22** is disposed in a recess **18** that is defined in the coupling nut **2**.

The coupling nut **2** is adapted to rotate clockwise and counterclockwise with respect to the connector body **3** in the unlocked position of the assembly **1**. Internal threads **10** are defined on the proximal end of the coupling nut **2**. The threads **10** are configured to be threadedly connected to the coupling member (not shown). The threads **10** may be substituted with bayonets or other fastening means. A series of splines **16** are defined on the distal end of the coupling nut **2**. The splines **16** are adapted to releasably engage corresponding splines **32** on the circumference of the lock ring **5**. A grip pattern **14** is provided on the outer surface of the coupling nut **2** to facilitate rotation of the coupling nut **2**. Axially-extending channels **12** are defined on the exterior surface of the coupling nut. The channels **12** are adapted to provide extra grip or match projections (not shown) on a tool (e.g., a ratchet, a wrench, etc.) that is used to rotate the coupling nut **2**. The size and shape of the channels **12** may vary from that which is shown and described. Also, the channels **12** are optional features of the coupling nut **2**.

The first resilient member **4** is positioned between the lock ring **5** and the coupling nut **2** to bias the lock ring **5** in a distal direction away from the coupling nut **2**. The resilient member **4** may be a spring, a wave spring, etc. The resilient member **4** may include one resilient element as depicted in FIG. **1**A or multiple resilient elements as depicted in FIGS. **1**B and **1**C. Other suitable resilient members will be understood by one of skill in the art from the description herein.

The lock ring **5** is translatably positioned within the annular space that is defined between the coupling nut **2** and the connector body **3**. A series of axially-extending splines **32** are provided along at least a portion of the circumference of the lock ring **5**.

The rotatable index ring **6** is sandwiched between the lock ring **5** and the push ring **7**. The proximal end surface **40** of the rotatable index ring **6** has an undulating profile **41**. The undulating profile **41** reduces the contact area between the index ring **6** and the distal end face **34** of the lock ring **5**, thereby providing for easier rotation of the rotatable index ring **6**. The distal end face **54** of the rotatable index ring **6** includes a series of protruding elements **44**, each of which project in a distal direction toward the fixed index ring **9**. The protruding elements **44** are also referred to hereinafter as teeth **44**.

The push ring **7** is sandwiched between the rotatable index ring **6** and the resilient member **8**. The push ring **7** is slidably and non-rotatably positioned over the fixed index ring **9** such that at least a portion of the fixed index ring **9** is positioned within the interior of the push ring **7**. The rotatable index ring **6** is at least partially positioned within the interior of the push ring **7**.

The interior circumference of the push ring **7** includes a protruding surface **66** having a saw-tooth profile. The protruding surface **66** is also referred to hereinafter collectively as teeth **66**. The apex of each tooth **66** is positioned to bear on the center of a respective tooth **44** of the rotatable index ring **6** to cause translation and rotation of the rotatable index ring **6**, thereby moving the assembly **1** between locked and unlocked positions.

A series of alignment elements **68** protrude inwardly from alternating teeth **66** toward the axis of rotation 'A.' Each alignment element **68** has a triangular shaped cross-section, which matches the shape of the tooth **66** from which it extends. The alignment elements **68** are sized to fit within a respective unlock channel **92** of the fixed index ring **9**. Engagement between the alignment elements **68** and the unlock channels **92** prevents rotation of the push ring **7** with respect to the other components of the assembly **1**, and permits translation of the push ring **7** along the depth dimension of the unlock channels **92**. The alignment elements **68** may also be referred to herein as teeth **68**.

The push ring **7** includes an outer surface **64** that is visible when the locking connector assembly **1** is in the unlocked position, thereby providing an indication to the user as to whether the locking connector assembly **1** is maintained in either the locked or the unlocked position. By comparing FIGS. **2**A and **3**A, it is seen that the coupling nut **2** is disposed over a portion outer surface **64** when the locking connector assembly **1** is in the locked position. It is contemplated that the outer surface **64** may be of a color different than the other components of the assembly **1** to sufficiently indicate whether the locking connector assembly **1** is in the locked or unlocked position. The surface **64** may also include indicia such arrows and/or text to identify the locked and unlocked positions.

The fixed index ring **9** is rotationally and translationally fixed to the exterior surface of the connector body **3**, as previously described. The fixed index ring **9** includes a top portion **82**, a structured portion **78** that extends from the shoulder **83** of the top portion **82**, and a wall **76** that includes the plurality of resilient tabs **88**. The wall **76** of the fixed index ring **9** extends at least partially through the second resilient member **8**, the push ring **7**, the rotatable index ring **6** and the lock ring **5**.

The structured portion **78** of the fixed index ring **9** includes alternating unlock channels **92** and lock channels **90** that form an intricate saw tooth profile. The teeth **44** of the rotatable index ring **6** are received in the unlock channels **92** and lock channels **90** in an alternating manner. In other words, in an unlocked position of the assembly **1**, all of the teeth **44** are positioned in the unlock channels **92**. Conversely, in a locked position of the assembly **1**, all of the teeth **44** are positioned in

the lock channels **90**. The depth 'D_L' of each lock channel **90** is less than the depth 'D_U' of each unlock channel **92**. The depth of each channel **90** and **92** influences the position of the splines **32** of the lock ring **5** with respect to the splines **16** of the nut **2**.

The second resilient member **8** is sandwiched between the underside surface of the shoulder **83** of the fixed index ring **9** and the distal end face **75** of the push ring **7**. The second resilient member **8** biases the push ring **7** in a proximal direction toward the coupling nut **2**, thereby creating an opposing biasing force with the first resilient member **4**. The second resilient member **8** may be a spring, a wave spring, etc. The second resilient member **8** may include one or more resilient elements, as depicted. Other elements for biasing the locking connector assembly will be understood by one of skill in the art from the description herein.

FIGS. **2**A and **2**B depict the locking connector assembly **1** in an unlocked position. In the unlocked position of the assembly **1**, the lock ring **5** is in the disengaged position because the splines **32** of the lock ring **5** are separated and disengaged from the corresponding splines **16** of the coupling nut **2** thereby permitting rotation of the coupling nut **2** with respect to the connector body **3**. In the unlocked position of the assembly **1**, the proximal section **58** of the push ring **7**, and any indicia applied thereto, is visible to a user of the assembly **1**.

FIGS. **4**A, **4**B, **5**A and **5**B also depict the locking connector assembly **1** in an unlocked position. In the unlocked position of the assembly **1**, each tooth **44** of the rotatable index ring **6** is positioned within a respective unlock channel **92** of the fixed index ring **9**. Each alignment element **68** is also disposed within a respective unlock channel **92**. The depth 'D_U' of the unlock channels **92** is sized so that when the teeth **44** are positioned therein, the lock ring **5**, which is biased against the rotatable index ring **6** by the resilient member **4**, is positioned such that the splines **32** are separated from and disengaged with the splines **16** of the coupling nut **2**. Because the lock ring **5** is disconnected from the coupling nut **2**, the coupling nut **2** is able to rotate with respect to the connector body **3**.

FIGS. **3**A and **3**B depict the locking connector assembly **1** in a locked position. In the locked position of the assembly **1**, the splines **32** of the lock ring **5** are engaged with the corresponding splines **16** of the coupling nut **2** thereby preventing rotation of the coupling nut **2** with respect to the connector body **3**. More specifically, the lock ring **5** is fixed to the coupling nut **2** by the splines **16** and **32**, and the lock ring **5** is also fixed to the connector body **3** by engagement between the rails **24** and slots **36**. Because the lock ring **5** is rotationally locked to both the coupling nut **2** and the connector body **3**, the coupling nut **2** is locked and prevented from rotating on the connector body **3**.

Additionally, in the locked position of the assembly **1**, the coupling nut **2** is disposed over the lower section **58** of the push ring **7** such that the lower section **58**, and any indicia applied thereto, is not visible to a user.

FIGS. **6**A and **6**B also depict the locking connector assembly **1** in a locked position. In the locked position of the assembly **1**, the teeth **44** of the rotatable index ring **6** are positioned in the lock channels **90** of the fixed index ring **9** thereby causing the splines **32** of the lock ring **5** to engage with the corresponding splines **16** of the coupling nut **2**. In the locked position, the slanted surfaces **46** of the teeth **44** contact the slanted surfaces **93** of respective lock channels **90**. The depth 'D_L' of the lock channels **90** is sized so that when the teeth **44** are positioned therein, the splines **32** of the lock ring **5** are meshed and engaged with the corresponding splines **16** of the coupling nut **2**.

Operation of the locking connector assembly **1** will now be described with reference to FIGS. **2**A-**6**B in accordance with one exemplary embodiment of the invention. When the locking connector assembly **1** is maintained in the unlocked position, as shown in FIGS. **2**A, **2**B and **4**A-**5**B, the teeth **44** are positioned in the unlock channels **92** of the fixed index ring **9** and the splines **32** of the lock ring **5** are separated from the corresponding splines **16** of the coupling nut **2**, as described above.

To move the assembly **1** from the unlocked position to the locked position, the user depresses the push ring **7** in a proximal direction toward the coupling nut **2**. This causes the teeth **66** and **68** of the push ring **7** to bear on the teeth **44** of the rotatable index ring **6**, which causes the rotatable index ring **6** to bear on the lock ring **5**. Further translation of the push ring **7** translates both the rotatable index ring **6** and the lock ring **5** in the proximal direction against the force of the first resilient member **4** until the teeth **44** of the rotatable index ring **6** move outside of the unlock channels **92** of the fixed index ring **9**. At this point, the lock ring **5** is sufficiently advanced in the proximal direction such that the splines **32** of the lock ring **5** are meshed and engaged with the corresponding splines **16** of the coupling nut **2**. Once the teeth **44** of the rotatable index ring **6** are positioned outside of the unlock channels **92** of the fixed index ring **9**, further translational movement of the push ring **7** in the proximal direction against the force of the compressed first resilient member **4** causes the slanted surfaces **46** of the teeth **44** of the rotatable index ring **6** to slide along the slanted surfaces of the teeth **66** and **68** of the push ring **7**. The sliding action of the teeth **44** of the rotatable index ring **6** results in the rotation of the rotatable index ring **6** about the longitudinal axis 'A.' The rotatable index ring **6** rotates by a distance equal to half of the width 'W' (see FIG. **5**B) of the teeth **44** until the teeth **44** of the rotatable index ring **6** are aligned with, but are still positioned outside of, the lock channels **90** of the fixed index ring **9** that are directly adjacent to the unlock channels **92** in which the teeth **44** were previously positioned.

The push ring **7** is then released by the user. Releasing the push ring **7** causes the resilient member **4** to translate the lock ring **5**, the rotatable index ring **6** and the push ring **7** in the distal direction (i.e., away from the coupling nut **2**). The teeth **44** of the rotatable index ring **6** move into the entrance of the lock channels **90**. The resilient member **4** then presses the slanted surfaces **46** of the teeth **44** against the respective slanted surfaces **93** of the lock channels **90**. Due to the matching geometries of the aforementioned surfaces, the biasing force provided by the resilient member **4** causes the rotatable index ring **6** to rotate further in the same rotational direction, moving the teeth **44** radially further into the lock channels **90**. The rotatable index ring **6** continues to rotate until the tall sides **50** of the teeth **44** come into contact with the walls **95** of the respective lock channels **90**. When the teeth **44** are seated within their respective lock channels **90**, the splines **16** and **32** are engaged and the assembly **1** is maintained in the locked position, as was described previously. In the locked position, the lower section **58** of the push ring **7** is not visible, indicating the locking connector assembly **1** is in the locked position.

To move the assembly **1** from the locked position to the unlocked position, the user depresses the push ring **7** in a proximal direction toward the coupling nut **2**. This causes the teeth **66** of the push ring **7** to bear on the teeth **44** of the rotatable index ring **6**, which causes the rotatable index ring **6** to bear on the lock ring **5**. Further translation of the push ring **7** translates both the rotatable index ring **6** and the lock ring **5** in the proximal direction against the force of the first resilient member **4** until the teeth **44** of the rotatable index ring **6** move

outside of the lock channels **90** of the fixed index ring **9**. At this point, the lock ring **5** is sufficiently advanced in the proximal direction such that the splines **32** of the lock ring **5** are meshed and engaged with the corresponding splines **16** of the coupling nut **2**. Once the teeth **44** of the rotatable index ring **6** are positioned outside of the lock channels **90** of the fixed index ring **9**, further translational movement of the push ring **7** in the proximal direction against the force of the compressed first resilient member **4** causes the slanted surfaces **46** of the teeth **44** of the rotatable index ring **6** to rotate by a distance equal to half of the width 'W' (see FIG. **5**B) of the teeth **44** along the slanted surfaces of the teeth **66** of the push ring **6**. In other words, the sliding action of the teeth **44** of the rotatable index ring **6** results in the rotation of the rotatable index ring **6** about the longitudinal axis 'A.' The rotatable index ring **6** rotates until the teeth **44** of the rotatable index ring **6** are aligned with, but are still positioned outside of, the respective surfaces **86** of the walls **94** of the fixed index ring **9** that are directly adjacent to the lock channels **90** in which the teeth **44** were previously positioned. It should be understood that the rotatable index ring **6** only rotates in a single rotational direction, according to this exemplary embodiment of the invention.

The push ring **7** is then released by the user. Releasing the push ring **7** causes the resilient member **4** to translate the lock ring **5**, the rotatable index ring **6** and the push ring **7** in the distal direction (i.e., away from the coupling nut **2**). The teeth **44** of the rotatable index ring **6** move against the slanted surfaces **86**. The resilient member **4** continues to press the slanted surfaces **46** of the teeth **44** against the respective slanted surfaces **86** of the walls **94**, which causes the surfaces **46** to slide along the surfaces **86** until the teeth **44** of the rotatable index ring **6** spring into the unlock channels **92**.

When the teeth **44** are seated within their respective unlock channels **92**, the splines **16** and **32** are separated and the assembly **1** is maintained in the unlocked position, as was described previously. In the unlocked position, the lower section **58** of the push ring **7** is visible, indicating the locking connector assembly **1** is in the unlocked position.

Although the invention is illustrated and described herein with reference to specific embodiments, the invention is not intended to be limited to the details shown. Rather, various modifications may be made in the details within the scope and range of equivalents of the claims and without departing from the invention.

What is claimed:

1. A releasable locking connector assembly, comprising:

a connector body;

a coupling nut that is rotatably coupled to the connector body;

a first set of splines that are positioned on either the connector body or the coupling nut;

a lock ring having a second set splines, the lock ring being axially movable with respect to the connector body and the coupling nut between an engaged position and a disengaged position, wherein the second set of splines of the lock ring are engaged with the first set of splines when the lock ring is in the engaged position in order to prevent rotation of the coupling nut with respect to the connector body, and the second set of splines of the lock ring are disengaged from the first set of splines when the lock ring is in the disengaged position in order to permit rotation of the coupling nut with respect to the connector body;

a moveable index ring that bears on the lock ring and is movable between a locked position, in which the lock ring is maintained in the engaged position, and an unlocked position, in which the lock ring is maintained in the disengaged position; and

a push ring for sequentially moving the moveable index ring between the locked and unlocked positions.

2. The releasable locking connector assembly of claim **1**, further comprising a resilient member that is positioned to bias the lock ring away from the coupling nut.

3. The releasable locking connector assembly of claim **1** further comprising a fixed index ring that is fixedly mounted to the connector body, wherein the fixed index ring cooperates with the moveable index ring, wherein the moveable index ring is positionable on the fixed index ring in either the locked position or the unlocked position.

4. The releasable locking connector assembly of claim **3**, wherein the moveable index ring is located a different distance away from the fixed index ring in the locked position than in the unlocked position.

5. The releasable locking connector assembly of claim **3**, wherein the fixed index ring includes at least one lock channel and at least one unlock channel that has a different depth dimension than the lock channel, each channel being sized to receive a protruding element of the moveable index ring.

6. The releasable locking connector assembly of claim **5**, wherein the push ring includes a protruding surface for engaging the protruding element of the moveable index ring to move the moveable index ring between the at least one lock channel and at least one unlock channel of the fixed index ring.

7. The releasable locking connector assembly of claim **5**, wherein the protruding element of the moveable index ring has a slanted surface that bears on the protruding surface of the push ring, and the slanted surface is configured to slide along the protruding surface of the push ring to induce rotation of the moveable index ring in a pre-determined rotational direction.

8. The releasable locking connector assembly of claim **5**, wherein the protruding element of the moveable index ring has a slanted surface that is configured to slide along a slanted surface of the lock channel of the fixed index ring to induce rotation of the moveable index ring in a pre-determined rotational direction.

9. The releasable locking connector assembly of claim **5**, wherein the protruding element of the moveable index ring has a slanted surface that is configured to slide along a slanted surface of the unlock channel of the fixed index ring to induce rotation of the moveable index ring in a pre-determined rotational direction.

10. The releasable locking connector assembly of claim **5**, wherein the push ring includes an alignment element that is positioned in either the locked channel or the unlocked channel of the fixed index ring for preventing rotation of the push ring with respect to the fixed index ring while permitting translation of the push ring with respect to the fixed index ring.

11. The releasable locking connector assembly of claim **1**, wherein the lock ring is rotationally fixed to the connector body.

12. The releasable locking connector assembly of claim **11**, further comprising a rail disposed on one of the connector body and the lock ring, that is adapted to be inserted through at least one channel that is disposed on the other of the connector body and the lock ring to prevent rotation of the lock ring with respect to the connector body and permit translation of the lock ring with respect to the connector body.

13. The releasable locking connector assembly of claim **1**, wherein the push ring further comprises a section that is visible to a user of the releasable locking connector assembly

when the lock ring is maintained in one of the disengaged position and the engaged position, and is not visible when the lock ring is maintained in the other of the disengaged position and the engaged position.

14. The releasable locking connector assembly of claim **1** further comprising a resilient member that is positioned to bias the push ring against the moveable index ring which, in turn, biases the moveable index ring against the lock ring which, in turn, biases the lock ring toward the coupling nut.

15. A releasable locking connector assembly, comprising:

a connector body;

a coupling nut that is rotatably coupled to the connector body;

a lock ring that is axially movable with respect to the connector body and the coupling nut between an engaged position, in which rotation of the coupling nut with respect to the connector body is prevented, and a disengaged position, in which rotation of the coupling nut with respect to the connector body is permitted;

a moveable index ring that bears on the lock ring and is movable between a locked position, in which the lock ring is maintained in the engaged position, and an unlocked position, in which the lock ring is maintained in the disengaged position; and

a push ring for sequentially moving the moveable index ring between the locked and unlocked positions.

16. The releasable locking connector assembly of claim **15** further comprising a fixed index ring that cooperates with the moveable index ring, wherein the moveable index ring is positionable on the fixed index ring to either the locked position or the unlocked position.

17. The releasable locking connector assembly of claim **15** further comprising a first set of splines that are positioned on either the connector body or the coupling nut, and a second set of splines that are positioned on the lock ring, wherein the second set of splines of the lock ring engage the first set of splines when the lock ring is maintained in the engaged position to prevent rotation of the coupling nut with respect to the connector body, and the second set of splines of the lock ring are disengaged from the first set of splines when the lock ring is maintained in the disengaged position to permit rotation of the coupling nut with respect to the connector body.

18. A releasable locking connector assembly, comprising:

a connector body;

a coupling nut that is rotatably coupled to the connector body;

a lock ring that is axially movable with respect to the connector body and the coupling nut between an engaged position, in which rotation of the coupling nut with respect to the connector body is prevented, and a disengaged position, in which rotation of the coupling nut with respect to the connector body is permitted;

a rotatable index ring that bears on the lock ring and is movable between a locked position, in which the lock ring is maintained in the engaged position, and an unlocked position, in which the lock ring is maintained in the disengaged position; and

a fixed index ring that cooperates with the rotatable index ring, wherein the rotatable index ring is positionable on the fixed index ring to either the locked position or the unlocked position.

19. The releasable locking connector assembly of claim **18** further comprising a push ring for sequentially rotating the rotatable index ring between the locked and unlocked positions.

20. The releasable locking connector assembly of claim **18** further comprising a first set of splines that are positioned on either the connector body or the coupling nut, and a second set of splines that are positioned on the lock ring, wherein the second set of splines of the lock ring engage the first set of splines when the lock ring is maintained in the engaged position to prevent rotation of the coupling nut with respect to the connector body, and the second set of splines of the lock ring are disengaged from the first set of splines when the lock ring is maintained in the disengaged position to permit rotation of the coupling nut with respect to the connector body.

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